JCSP Agents-Based Service Discovery for Pervasive Computing

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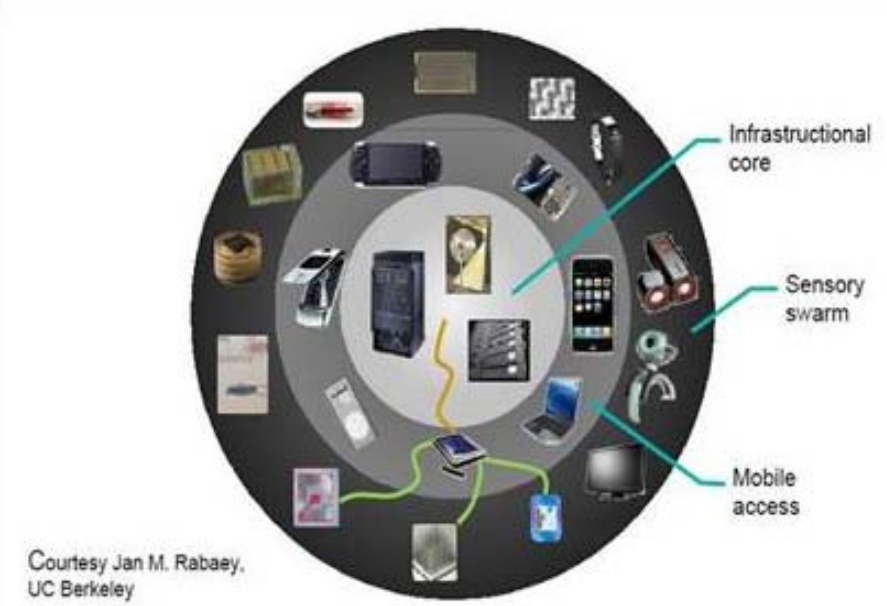
Introduction

- Pervasive computing
- Smart space
  - Many autonomous devices
  - Dynamic network
  - Preferred model: no central control or repository



Introduction

Problem:

How to discover available devices/services in the network?

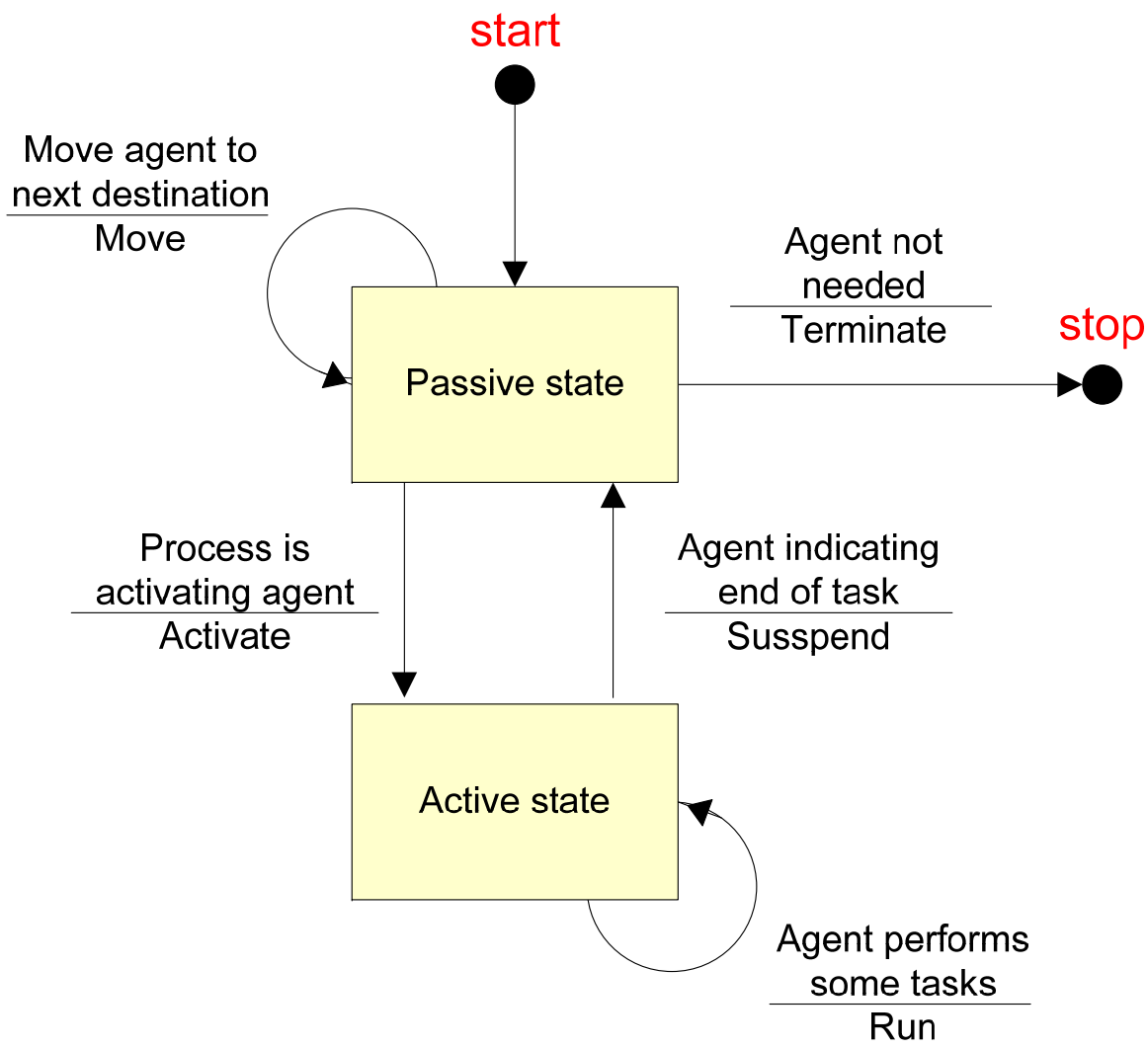
Proposed solution:

Send an agent around.

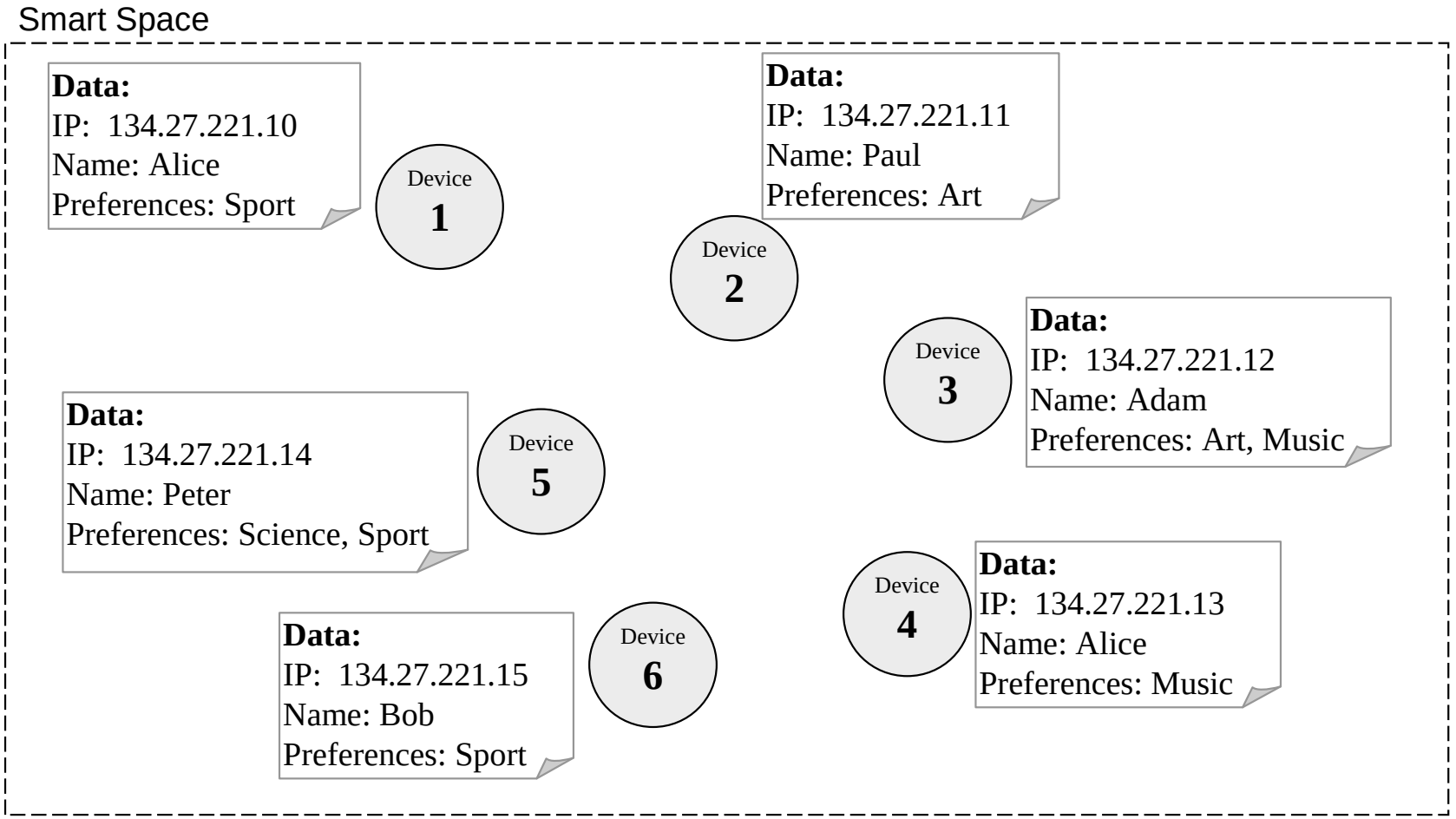
Agent

- Agent in Artificial Intelligence
- Mobile agent
- JCSP Agent
  - net2 protocol

JCSP Agent states



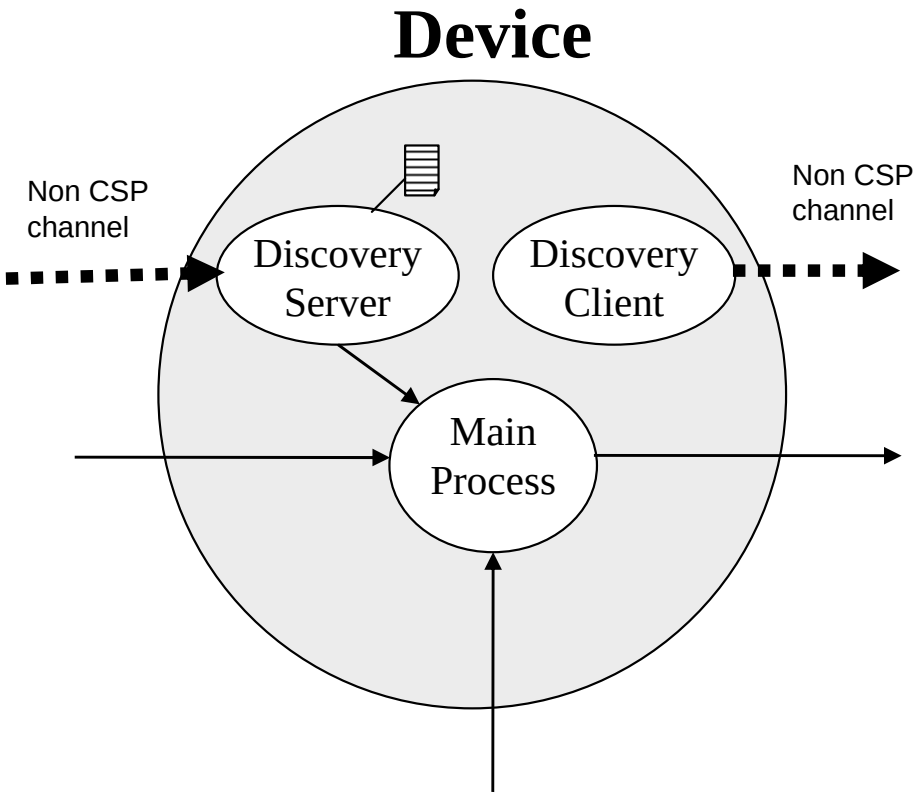
Scenario description



How to discover other devices and their properties and services?

Device discovery mechanism

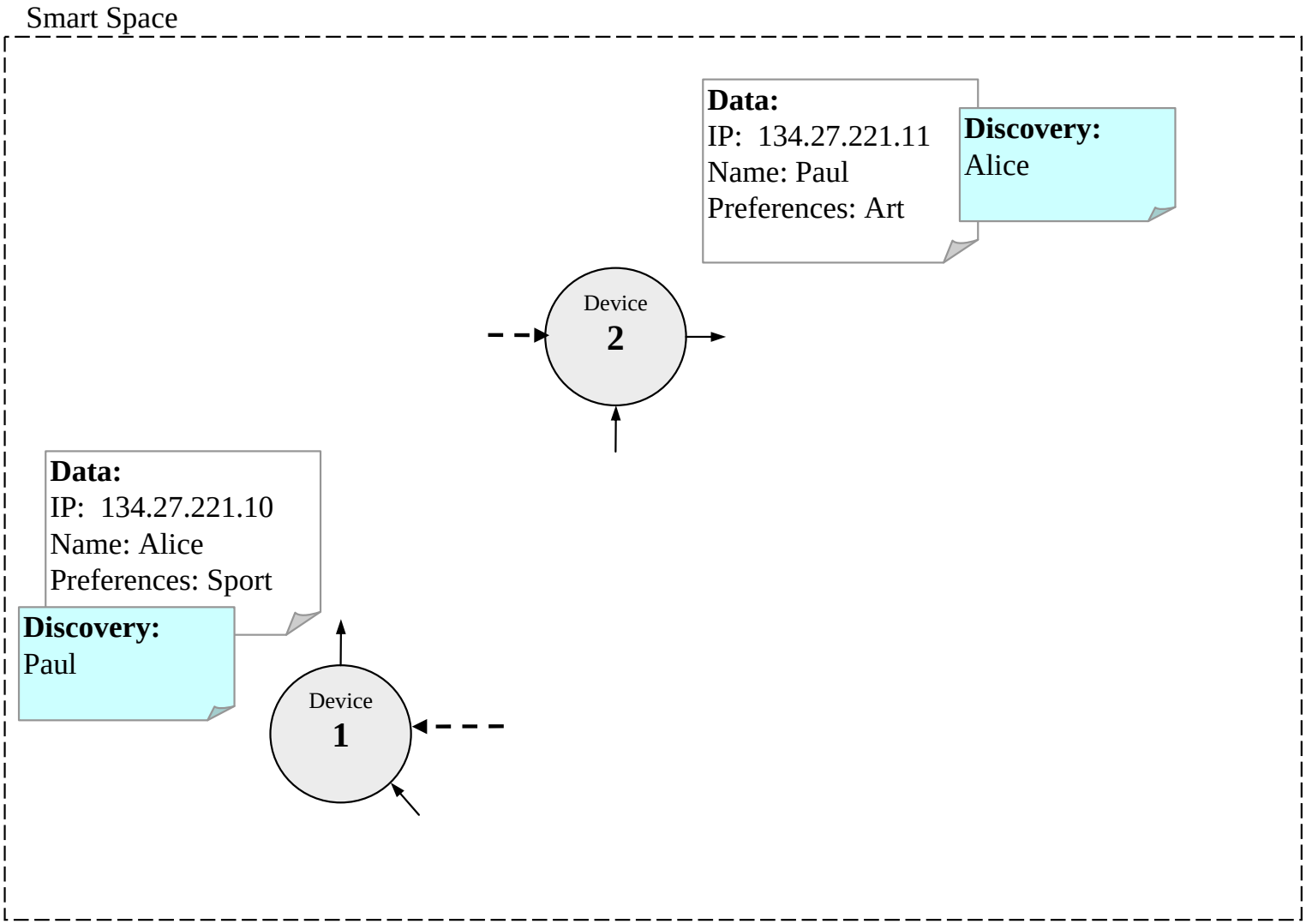
- *Discovery client* continuously sends a signal on a broadcast channel
- *Discovery server* continuously receives a signal and maintains its local list of available devices
- Every time the list if devices changes the *Main process* is informed



Service discovery mechanism

- Service discovery mechanism is triggered by new device in the network or when device changes its characteristics (for example change of interests of a device owner)
- Agent is sent to discover services and inform them about services offered by the new device
- Agent manages its own route of discovery based on a list of devices made by device discovery server
- Agent attaches to the device in its path and performs its assigned tasks, namely discover services
- Agent is a JCSP process

Message Room



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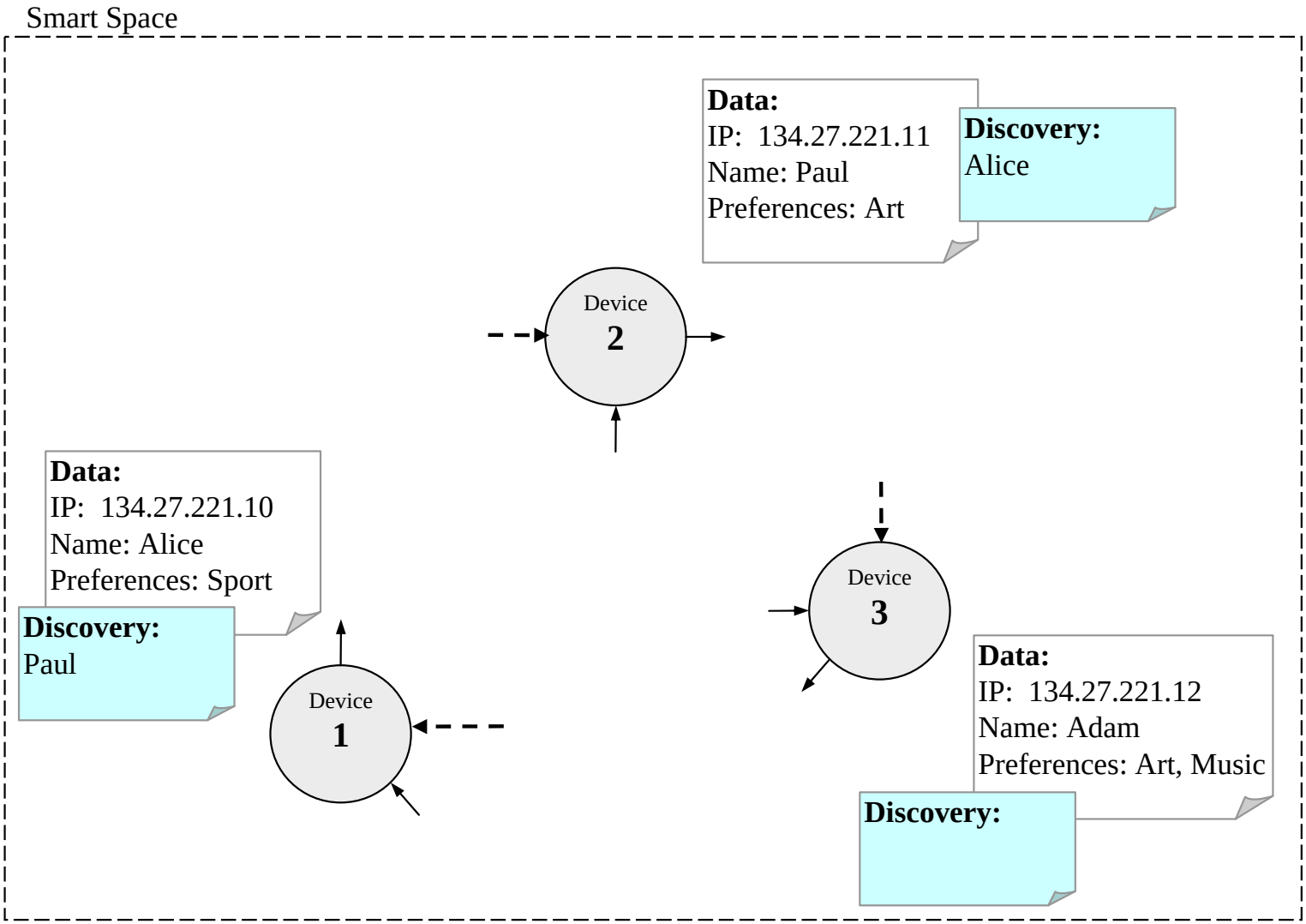

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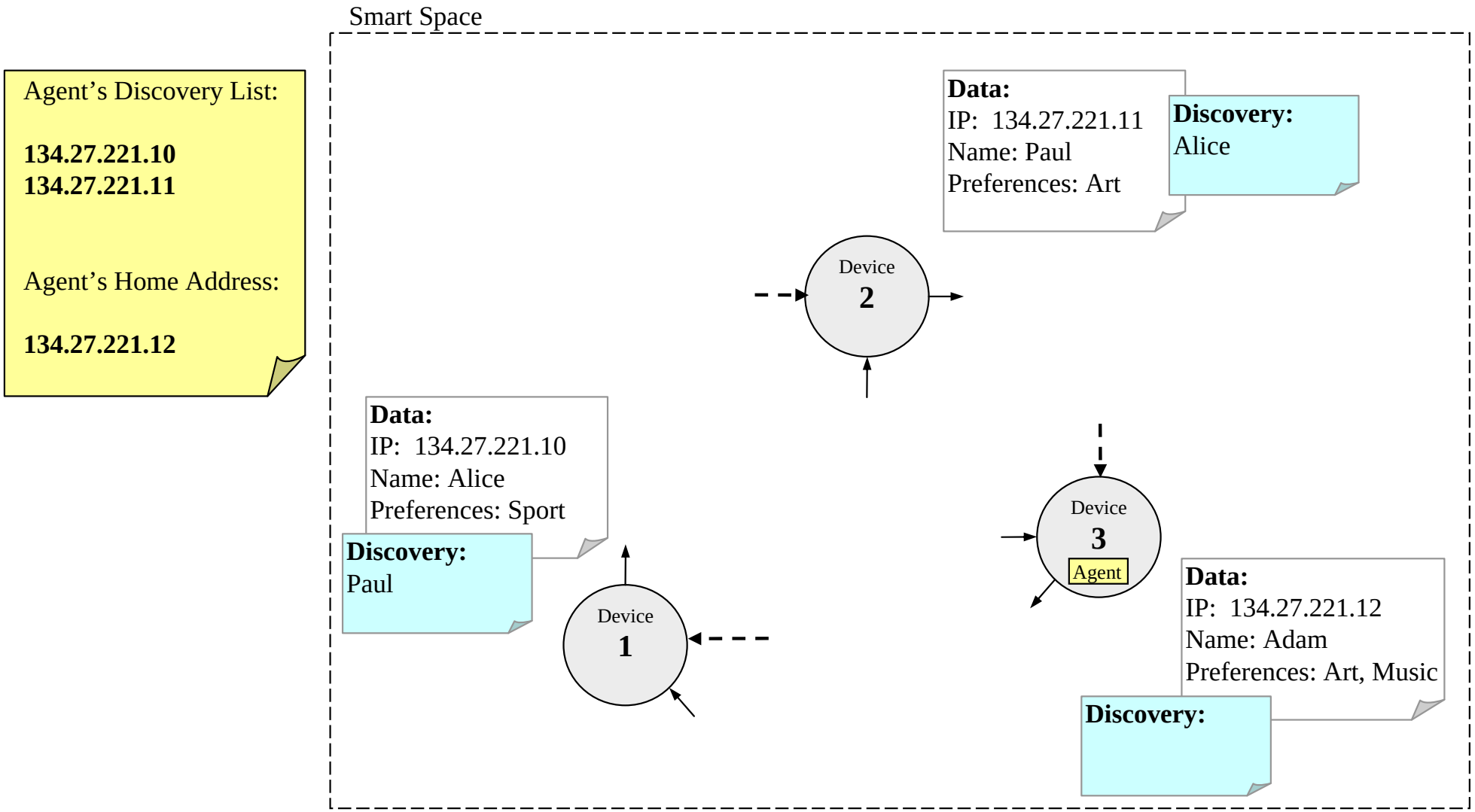


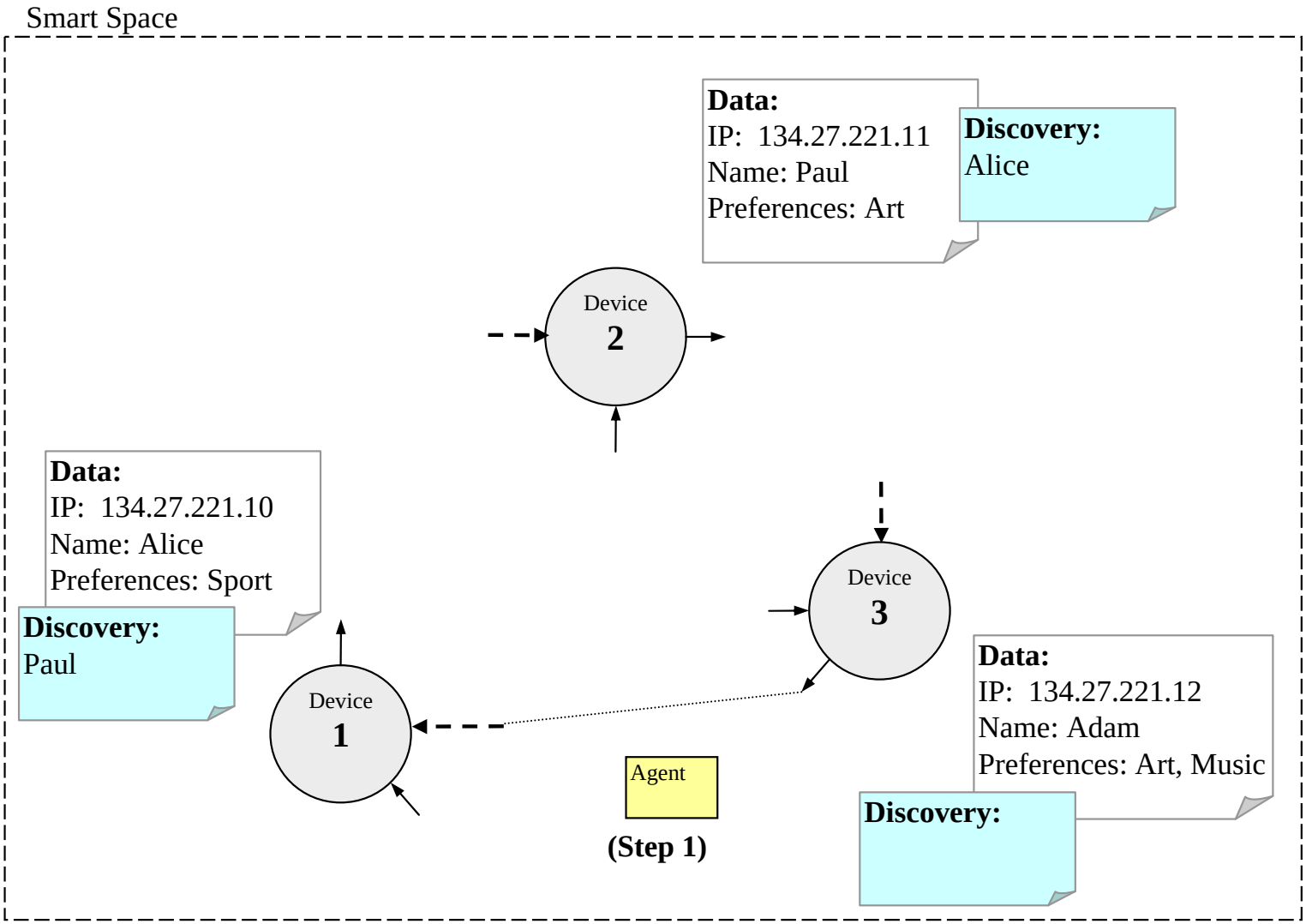
Message Room

Agent's Discovery List:

134.27.221.10
134.27.221.11

Agent's Home Address:

134.27.221.12



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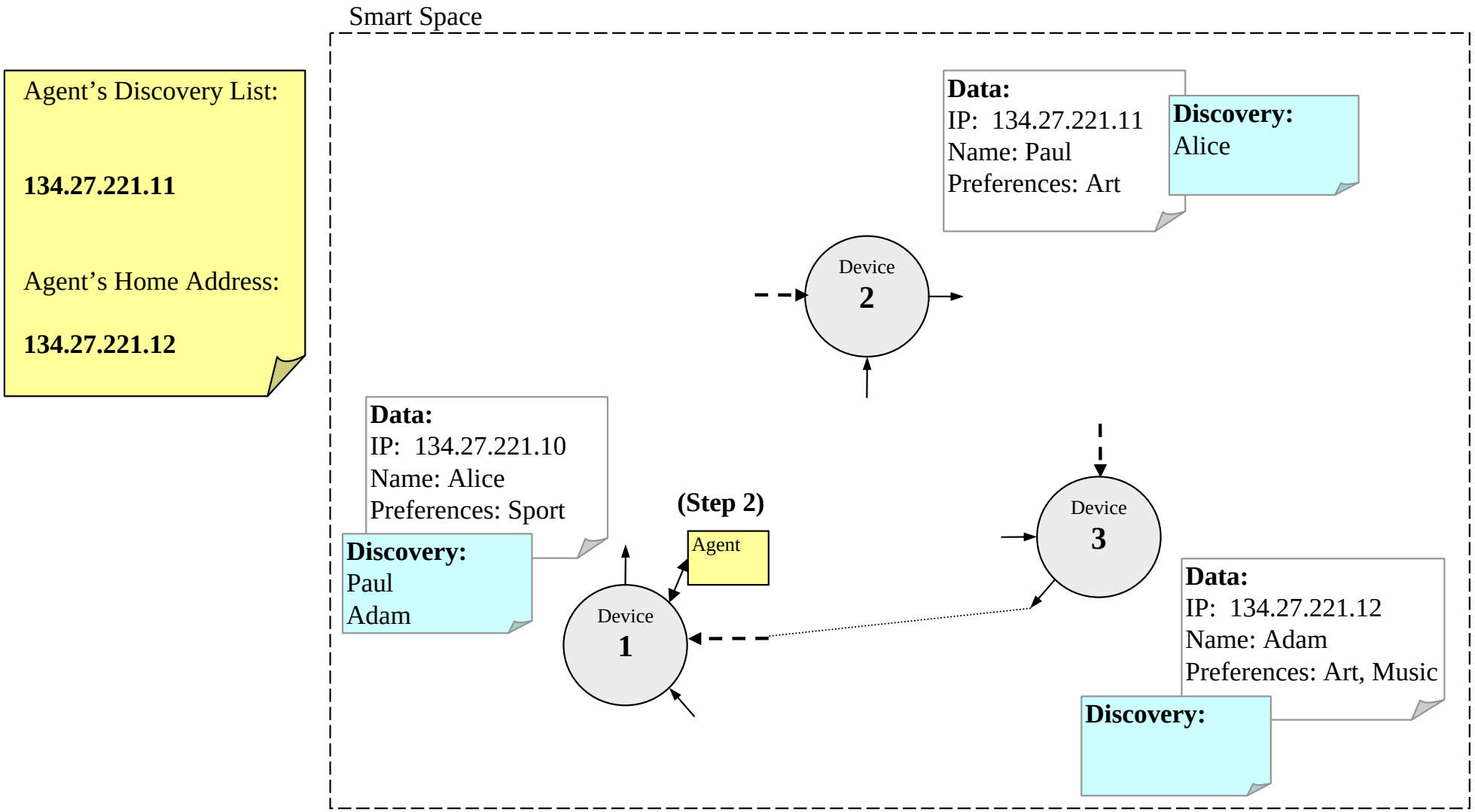

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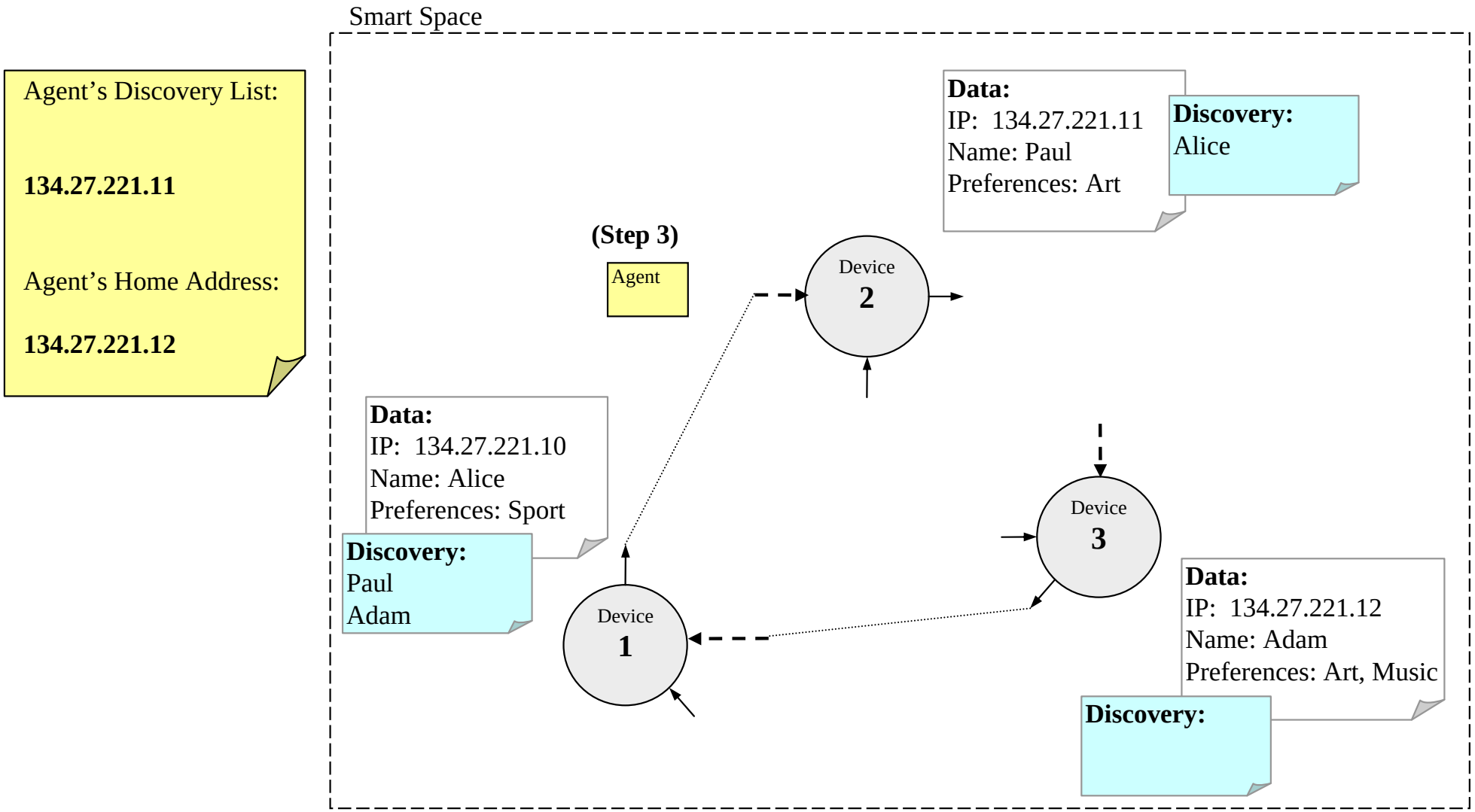

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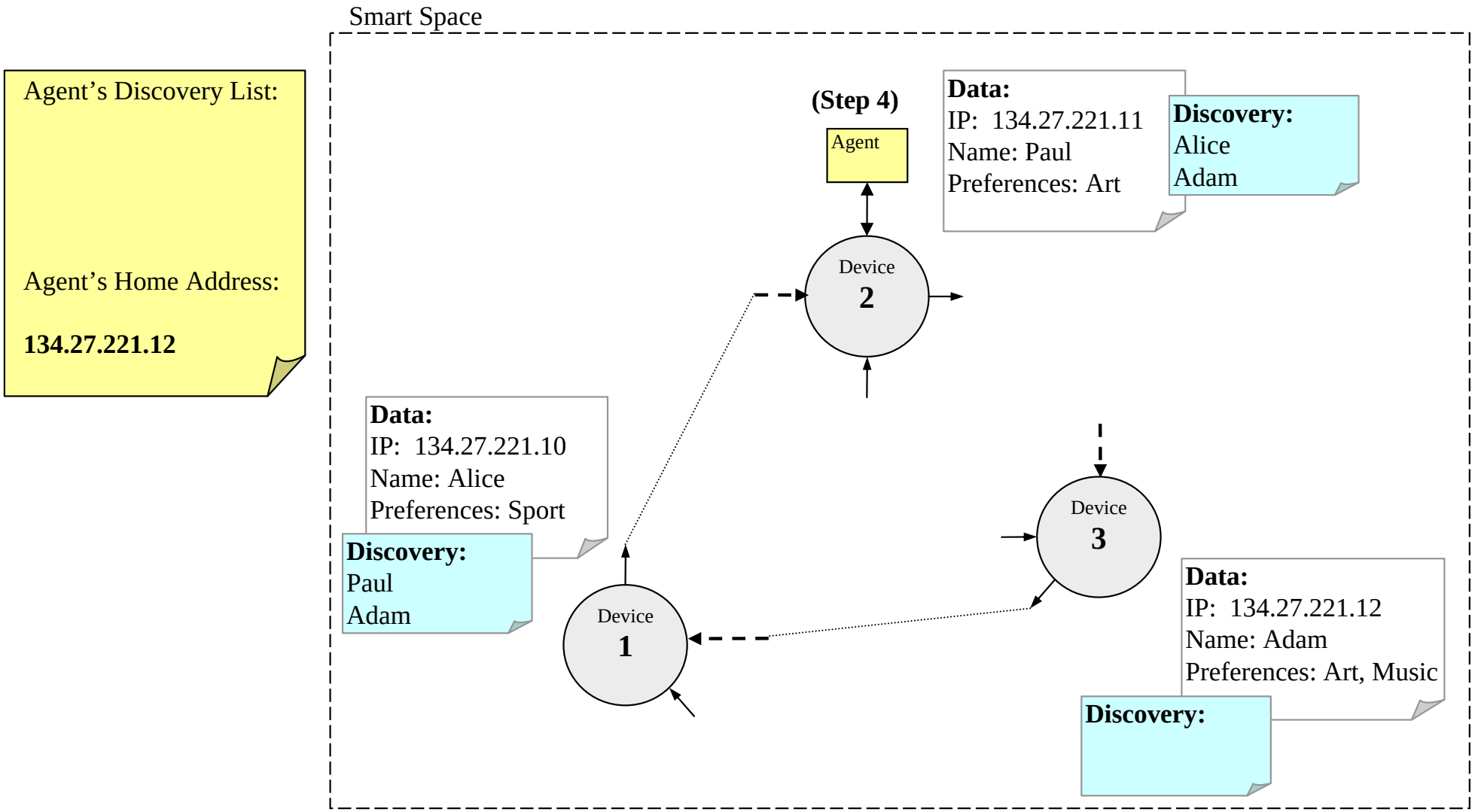

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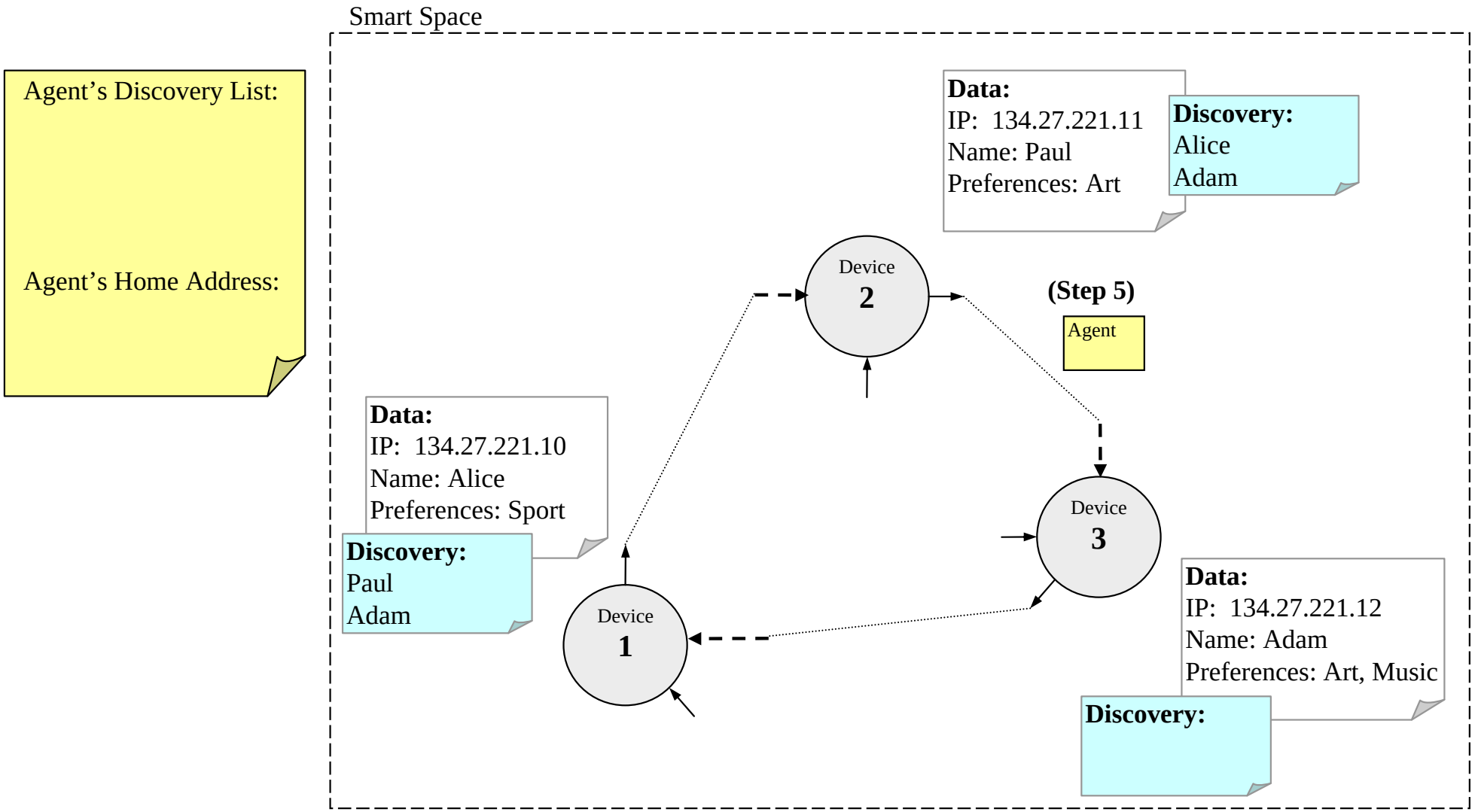

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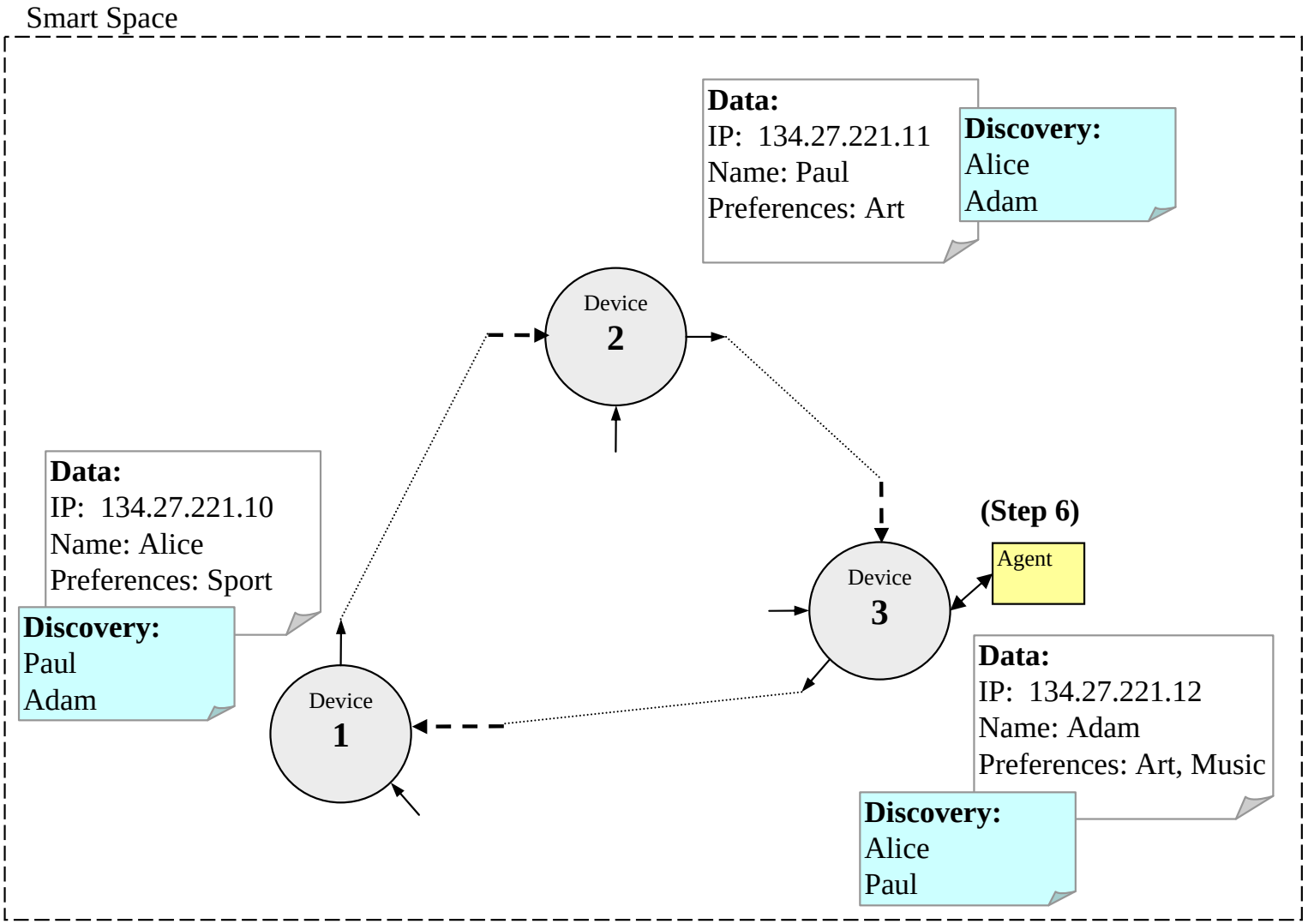
Agent's Discovery List:

Agent's Home Address:



Agent’s round trip results in:

Every device in the network is informed about services and properties of every other device once agent has gone around!

Experimental results

- The described scenario was built using PDAs (Dell Axim X5 with: Microsoft® Pocket PC OS, Intel® PXA255/400MHz, 64MB RAM, IBM J9 JVM)
- A network of 10 autonomous devices was implemented
- We confirmed dynamic configurability without any central control or repository
- Code size was 651 KB

Summary

- Service and device discovery in a smart space in pervasive computing is an issue
- We propose to use JCSP agents based system for service discovery
- We implemented scenario using mobile devices connected wirelessly
- A code size run on devices is 651 KB which is accepted for embedded devices

Future work

- Fixed size bag causing an early return to the home address
- Initiating multiple agents to discover large networks
- Dealing with agents that fail